OSHA Policy & Hazardous Energy Control Inspection Procedures

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Directorate of Enforcement Programs

All About OSHA

Was there a Need for the OSH Act?

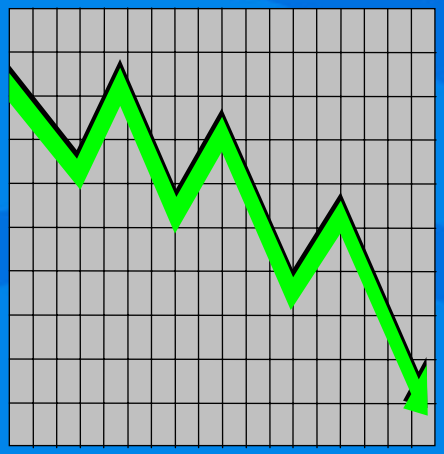
- In 1970, Congress considered these annual figures:
  - Job-related accidents: > **14,000 deaths**
  - Nearly **2.5 million** workers were **disabled**
  - Estimated new cases of occupational disease was 300,000

Current Statistics?

- **5,702 workplace fatalities** - 2005
- **5,764** workplace **fatalities** - 2004
- Perhaps **50,000 deaths** from work-related illnesses each year
- Nearly **4.3 million** non-fatal workplace injuries each year
- Injuries alone cost businesses over **$156 billion** annually

OSH Act Results

- Since OSHA's creation
  - Workplace fatalities have been cut by ~60% - 1970 vs. 2005 data
  - Occupational injury & illness rates decreased by ~40%



- While U.S. employment doubled
  - 115 million plus workers at 7.2 million worksites

What OSHA does?

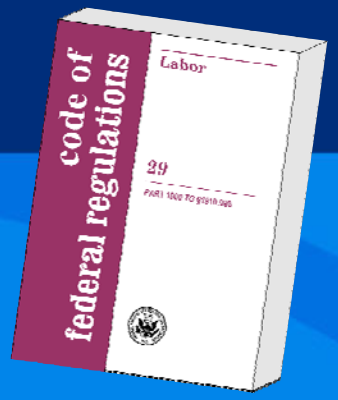
- Strong, fair & effective **enforcement**
- **Outreach & education**
  - **OSHA Training Institute (OTI)**
  - **OTI Education Centers**

- **Compliance assistance**: OSHA publications, e-tools, technical links, directives, interpretations

What OSHA does?

- **Partnerships & Alliances**
- **Voluntary protection programs**
  - Star
  - Merit
  - Star Demonstration
- **Free consultation programs**
  - Safety & Health Achievement Recognition Program (SHARP)

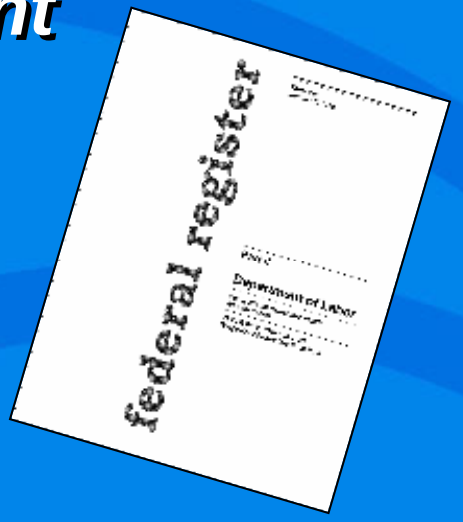
What OSHA does?



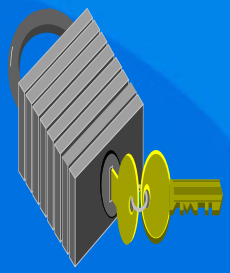
- Develops and enforces mandatory job **Safety & Health Standards**
- Maintains a **reporting** and **recordkeeping** system to monitor job-related injuries and illnesses
- Encourages employer's and employees to reduce workplace hazards and implement new or improve existing **Safety & Health Programs**

Safety & Health Programs

- ***Safety & Health Program Management***
  - Voluntary Guidelines for General Industry (26 JAN 1989 Federal Register)



- Mandatory Program Examples
  - Hazard Communication Program
  - Confined Space Program
  - Respiratory Protection Program
  - Hazardous Energy Control Program



OSHA Coverage

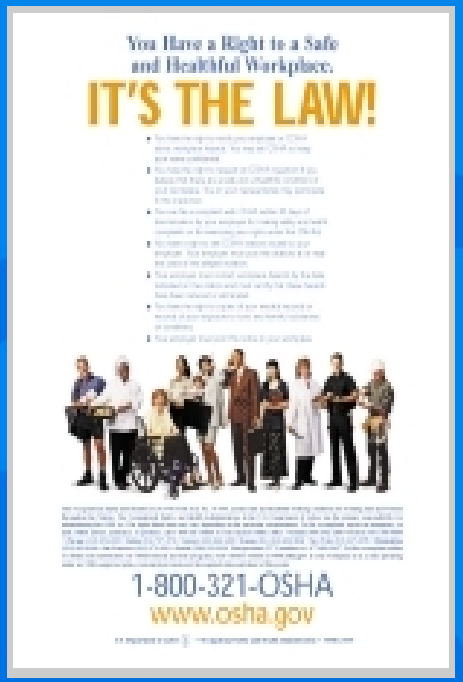
- **Private sector** employees through either
  - Federal OSHA or
  - OSHA approved State Program
- Some **States** have their own safety & health plans to cover state & local government workers
- **Federal workers** must comply 29 CFR Part 1960 & the OSHA standards
  - See www.osha.gov/dep/fap/index.html for details

Occupational Safety & Health Act of 1970

Public Law 91-596

Key

Provisions



The OSH Act's Purpose Section 2

…to assure so far as possible every working man and woman in the Nation safe and healthful working conditions and to preserve our human resources.

Duties - Section 5

- **General Duty** Clause: Each employer shall provide a place of employment which is free from **recognized hazards** that are causing or are likely to cause **death or serious physical** harm: §5(a)(1)
- **Employers** must comply with **promulgated safety & health standards**: §5(a)(2)
- **Employee** responsibilities: §5(b)

Employee Responsibilities

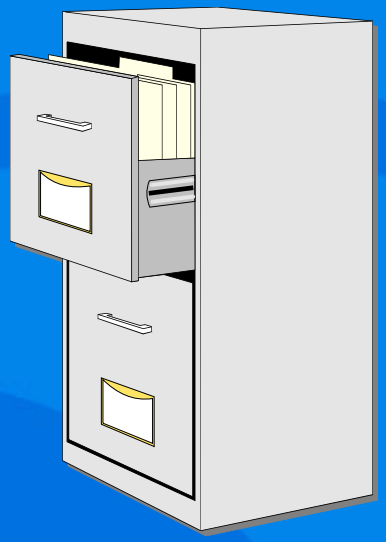
- **Follow** the employer's **safety and health rules**
- Use all required gear and protective equipment
- **Report hazardous conditions** to a **supervisor or** safety committee

Injury and Illness Records Section 8(c)

- **Report** to OSHA within **8 hours** any accident that results in a fatality or in-patient hospitalization of 3 or more employees.
  - See 29 CFR 1904.39
- Annual summary of Occupational Illness and Injury OSHA Log Form 300.
- OSHA 301 Injury & Illness Incident Report Form.

Recordable Injuries & Illnesses

- All occupational illnesses
- All occupational injuries if they result in:
  - Death;
  - One or more lost workdays;
  - Restriction of work or motion;
  - Loss of consciousness;
  - Transfer to another job; or
  - Medical treatment (other than first aid).



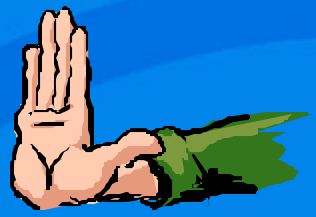
All Covered Employers Must :

- Recordkeeping forms - complete within 7 calendar workdays.

- Log summary posting requirements – February through April.
- Maintain **records** of occupational **injuries and illnesses** if they have 11 or more employees.
  - See 29 CFR 1904, Subpart C for forms & recording criteria

Workplace Inspection
Section 8

- Authority to inspect: 29 CFR §1903.3
- Unannounced inspection
  - No advanced notice
- Entry without delay
  - Inspection objections
- Inspection priorities
  - Imminent danger; catastrophes and fatal accidents; employee complaints; programmed high-hazard inspections; etc.



Sorry, but you will need a <u>WARRANT</u> to enter this job site.

OSHA Inspection Process

- Opening conference
  - Purpose & scope of inspection
  - Employer/employee representatives
- Inspection tour
  - Observation, photography, private interviews
  - Examination of records, facility inspection
- Closing & informal conferences
  - Discussion of findings, citation recommendations, appeal rights, contest procedures
  - Determine time needed for abatement

Citations and Penalties Section 17

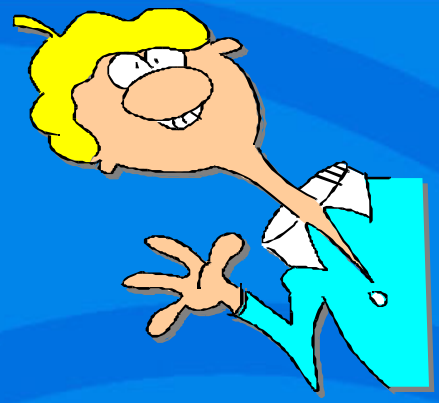
- Citations are issued by the Area Director

Other-than-serious	$0 - $7,000
Serious	$1,500 - $7,000
Willful	$5,000 - $70,000
Repeat	Up to $70,000
Failure-to-Abate	Up to $7,000/day
Egregious	Instance-by-instance penalty
Criminal	$250,000 and/or 6-months imprisonment

- Adjustments for size, history & employer good faith

Employee Rights

EXCUSE ME… MR. OSHA, SIR… COULD I TALK TO YOU ABOUT AN UNSAFE CONDITION?



- File a **complaint**
- Have their **names withheld** from their employer, upon request to OSHA, if they sign and file a written complaint
- Be advised of OSHA actions regarding a complaint and request a formal review of any decision not to inspect or issue a citation.

Complaint Policy

- Complaint Inspection
  - An inspection that is initiated primarily as a result of a complaint
  - Conducted by a OSHA at the employer's worksite
- Complaint Investigation – Phone & Fax
  - Does not include a worksite inspection.
  - Employer provides a written response
  - OSHA provides copies of the response to the complainant

Section 11(c) Whistleblower Protection

- Employees have a right to seek safety and health on the job without fear of punishment.
  - Complaining to an employer, union, OSHA or any other government agency about job safety and health hazards.
  - Filing a safety or health grievance.
  - Participating in OSHA inspections, conferences, hearing, or other OSHA related activities

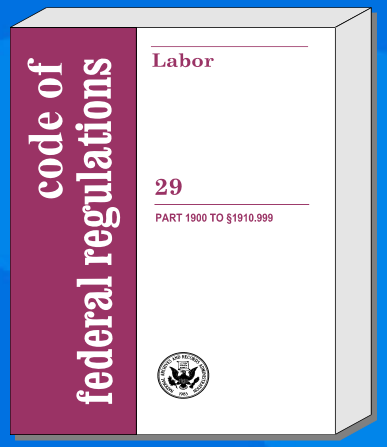
How OSHA Can Help?

- Full-service Area Offices
- Compliance assistance tools
- Free consultation:
  Small employers
- Sample programs
- Publications and internet services

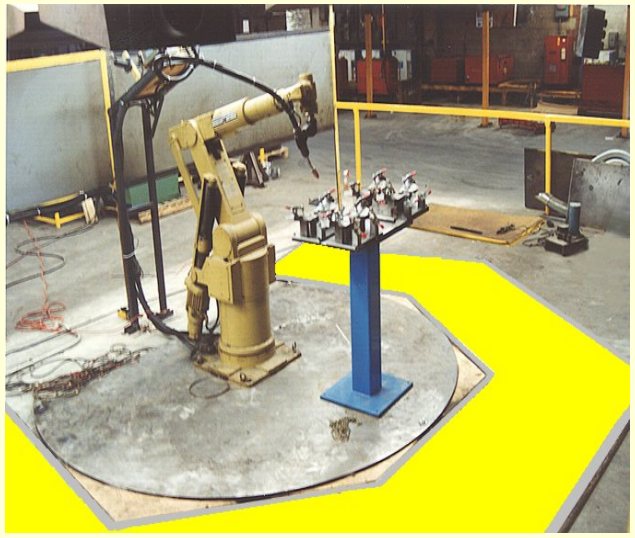
Current OSHA Information

- Electronic information
  - http://www.osha.gov
  - http://www.osha-slc.gov/
  - CD-ROM: OSHA Regulations, Documents and Technical Information (ORDT)

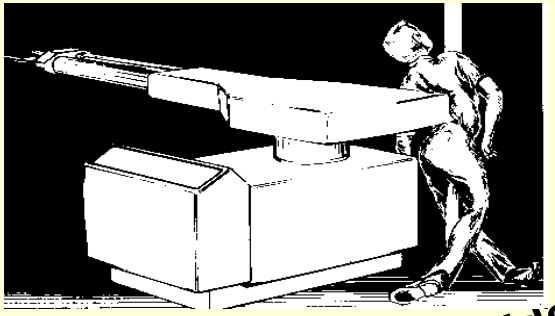
- Emergencies
  - (800) 321-OSHA for life-threatening emergencies



The Control of Hazardous Energy – Enforcement Policy & Inspection Procedures



Robot Accident Search



Fatally caught by robot
7/24/06

Crushed by robot
11/16/04

Fatal crushing
7/28/03

Head struck by gantry robot
1/19/01

Woman fatally pinned by robot welder
3/22/06

Caught in fatality
3/30/04

Robotic Fatality
12/29/01

Employee killed by robot arms
5/4/99

Employee killed in robotic weld cell
8/27/99

Killed when crushed by robot & conveyor
6/8/99

Electrocution
12/17/98

Fatally crush in car of robotic alvey machine
4/4/00

Fatally crushed in molding machine
8/18/02

Employee killed by Robotic hot metal pourer
2/15/96

Pinned by robotic drill/welder
11/7/96

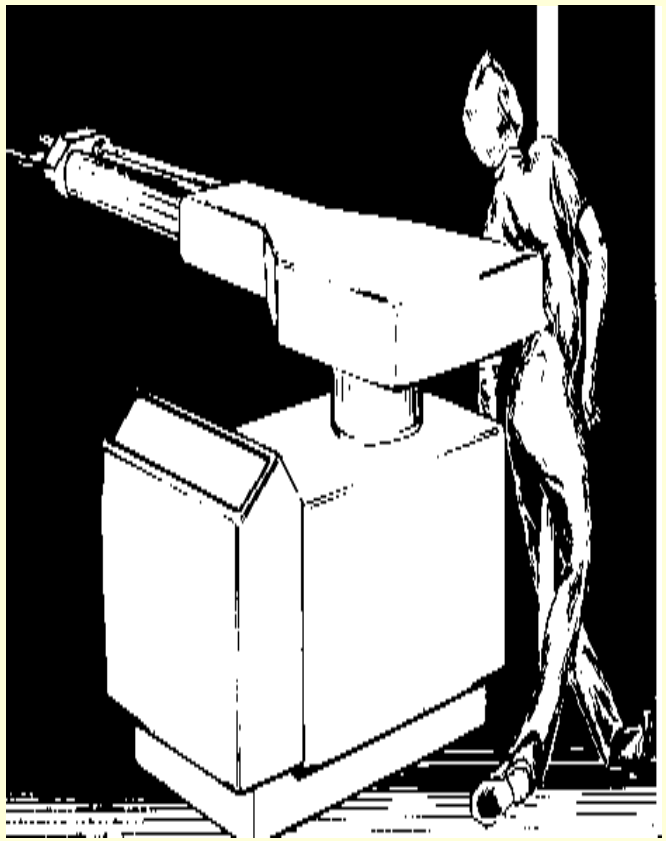
Fingers amputated while cleaning robot sensor
1/24/06

Source:
www.osha.gov/oshstats/index.html

Preventing the Injury of Workers by Robots

NIOSH ALERT (No. 85-103)

- July 21, 1984: operator fatally pinned at an automatic die cast system while cleaning scrap in envelope
- NIOSH recommendations
  - System design
    - Barriers, interlock gates, sensors
    - Light curtains, safety mats
    - Remote diagnostic instruments
    - Adequate clearances
    - Programming - reduced speeds
  - Training & supervision of workers



Hazardous Energy Control
OSHA Standards

- **Machinery & Machine Guarding** 29 CFR 1910, **Subpart O**

- ***Control of Hazardous Energy (Lockout/ Tagout)*** 29 CFR **1910.147**

- ***Electrical*** 29 CFR 1910, **Subpart S**

Machine Guarding

1910.212(a)(1)

- **Performance-oriented standard for normal production operations**

> *... requires one or more methods of machine guarding to effectively protect the operator(s) and other employees in the area around the machine from hazards when a machine or piece of equipment is being used to perform its intended production function.*

- Examples of guarding methods include: barrier guards, two-hand tripping devices, electronic safety devices, etc.

Point-of-Operation Guarding

1910.212(a)(3)(ii)

- *... the guarding device must be so designed and constructed so as to **prevent** (and not just warn or signal employees of the impending hazard) the operator from having any part of his or her body in the danger zone during the operating cycle.*

- Recognized good engineering practice, such as **national consensus standards**, may be used to meet this requirement if the action meets or exceeds the standard's requirements.

- For example … American National Standards Institute (ANSI) standards

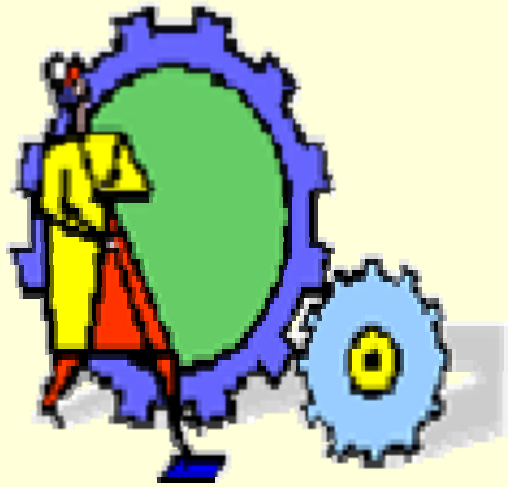
National Consensus Standards

- ***Safety Requirements for Robots & Robot Systems***: ANSI/RIA R15.06.1999
- ***Manufacturing Systems/ Cells***: ANSI B11.20-2004
- ***Performance Criteria for Safeguarding*** – *machine tools*: ANSI B11.19-2003

American
National
Standards
Institute

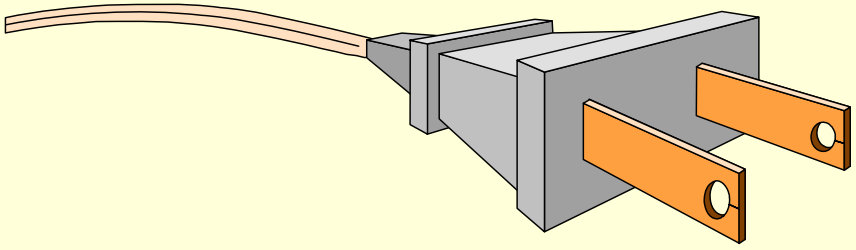
Mechanical Power Transmission
1910.219

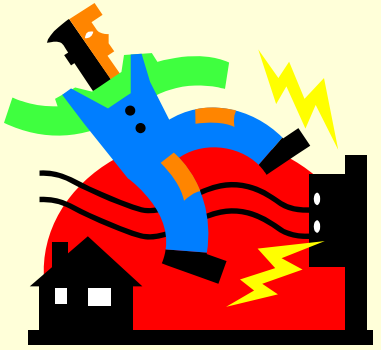
- Robots need to be designed to eliminate exposure to equipment power transmission components:
  - Motor couplings & shafting
  - Gears
  - Sprocket & chains
  - Drive belts & pulleys
  - Linkages



Electrical Safety-Related Work Practices: 29 CFR 1910 Subpart S

- Addresses employee exposure to electrical hazards from work on, near or with conductors or equipment in electric utilization installations
- Must de-energize unless there is a greater hazard or infeasible to do so
- Lockout & tagging: disconnecting means
- Control circuits may not be sole means to de-energize circuits





Electrical Lockout & Tagging

- De-energizing equipment
  - Disconnect from electric source
  - Discharge residual energy
- Application of locks & tags
- Verification of de-energization
  - Qualified person uses test instrument

See 1910.333(b)

Lockout/Tagout

§1910.147

- Requires employers to establish an energy control program, AND

- To utilize procedures for affixing LOTO devices to energy isolating devices, AND

- To otherwise disable/shut down machines/equipment to prevent **unexpected** energization, start-up or release of stored energy to prevent employee injury.

Robot Hazardous Energy Control

Safety & Health Topics

http://www.osha.gov/SLTC/robotics/index.html

- **Links** to control & prevention material
  - ***Industrial Robotics Standards - NIST***
  - ***OSH Technical Reference: Industrial Robots - DOE***
  - A **Neuro-Fuzzy Approach to Robot Safety - IEEE**
  - ***Safe Maintenance Guidelines for Robotic Workstations - NIOSH***
  - ***Case Studies***

- ***OSHA standards, directives & other relevant information***

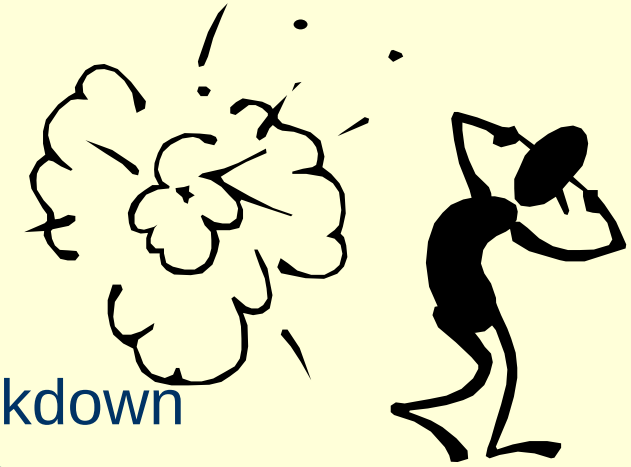
- ***Robotics benefits***

Industrial Robots & System Safety

OSHA Technical Manual; Section IV, Ch.4

- Safeguarding methods based on hazards analysis
  - System's use, programming & maintenance operations
- Effective safeguarding system protection
  - Operators, engineers, programmers, maintenance personnel
- Combination of safeguarding methods
  - Redundancy & backup systems

OSHA Technical Manual



- **Types of Accidents**
  - Impact or collision
  - Crushing & trapping
  - Mechanical parts – equipment breakdown
  - Other – electrical & pressured fluids

- **Sources of Hazards**
  - Improper design or installation
  - Human error or control errors
  - Power systems or environmental (interference) sources
  - Unauthorized access
  - Mechanical failures

OSHA Instruction STD 01-12-002

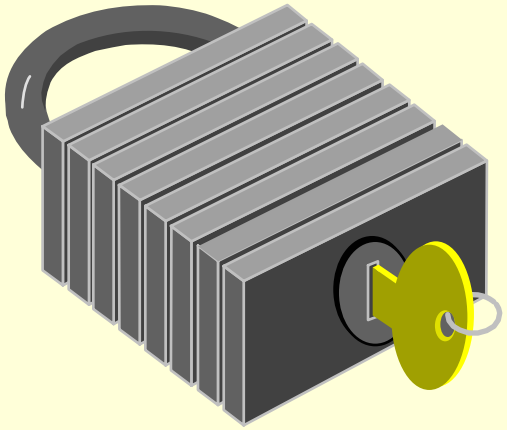
Guidelines for Robotics Safety

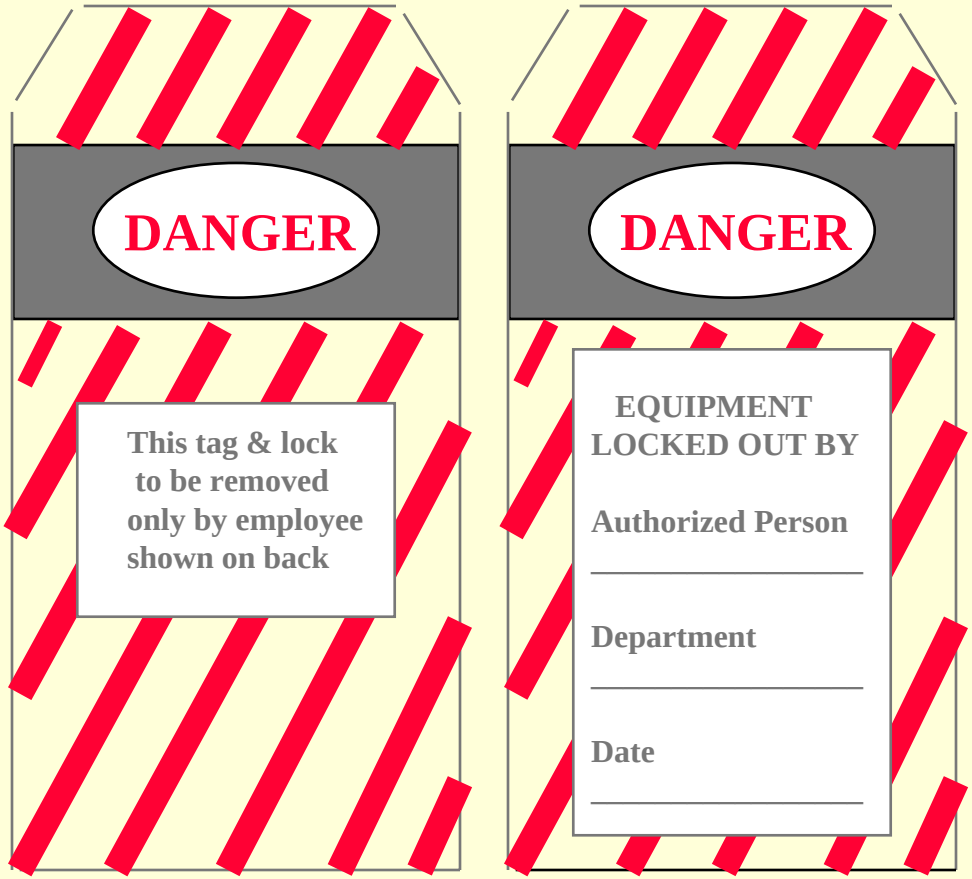
- ***ANSI-RIA R15.06-1986*** *evaluation*
  - *Safe use and operation of robots*
- *Appendix A Guidelines*
  - ***System safety*** *&* ***hazard analysis***
  - ***Guarding methods****: interlocked guards, barrier guards, awareness barriers, presence sensing devices, emergency braking, audible/visual warning*
  - ***Control devices***
  - ***Installation, maintenance*** *&* ***programming***
  - ***Robotics safety policy***
  - **Training**: management, operator, programming & maintenance personnel

Safety Requirements for Industrial Robots & Robot Systems ANSI/RIA R15.06-1992

- **Design** & **installation** requirements
- **Sources** of hazards
- **Safeguarding** performance requirements
  - Barrier guards: fixed & interlocked
  - Other devices: e.g., light curtains, area scans, safety mats systems, RF devices
- **Maintenance** & **repair** of robots
- **Testing** & **startup** of robot systems
- **Safety training** of personnel
- **Risk assessment** method

Lockout/Tagout Standard Overview





Minor Servicing Exception

- Limited Exception!
- Work is <u>minor</u> in nature
- Routine & repetitive
- **Performed during *Normal Production Operations***
- **Integral** (essential) to the use of the equipment for production
- Work is performed using alternative methods which provide ***effective protection***

Control of Hazardous Energy Lockout/Tagout & Alternative Methods: ANSI Z244.1-2003

Annex J: Alternative Method for Robotic Applications

- Annex addresses employee exposure during **teaching**, **servicing**, **tool changes**, **un-jamming**, **troubleshooting**
- Alternatives may be found in ANSI/RIA R15.06-1999
- Personnel doing task must have total control of the robot and use an alternative method:
  - Disable automatic task program; Drive motor energy isolation; Motion enabling device use; Locate robot arm in locked position
- OSHA has not formally evaluated all aspects of this consensus standard with respect to OSHA requirements. See the 10 NOV 2004 interpretation letter to Z244 Chairman

Energy Control Program

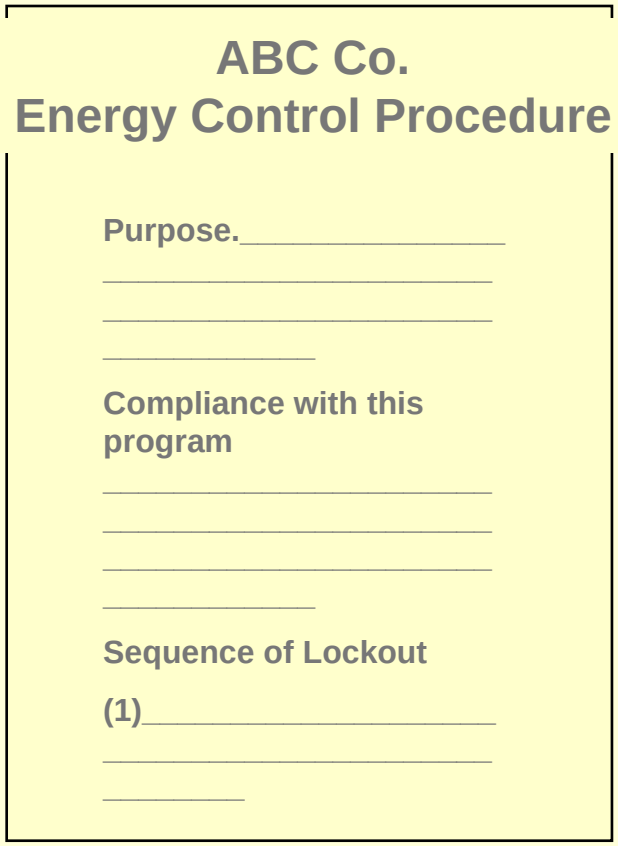
- **Energy control procedure**

  +

- **Employee training**

  +

- **Periodic inspection**



ABC Co.
Energy Control Procedure

Purpose._____
_____
_____
_____

Compliance with this program
_____
_____
_____
_____

Sequence of Lockout

(1)_____
_____
_____

Energy Control Procedures

… need to provide **sufficient detail** and **specific guidance** outlining the energy control steps to be followed so that authorized employees **clearly understand how to safely utilize hazardous energy control measures** for the machine being serviced or maintained.

Specific Procedures

OSHA retained the word ***specific*** in the final rule because overgeneralization does not provide employees with sufficient information to effectively control hazardous energy.

- Generic procedures alone are unacceptable.
- Employers do effectively supplement generic procedures with other guidance means -- e.g., work permits, checklists.

Procedure Grouping

- Similar machines/equipment may be grouped together if they are listed in the procedure scope & if they all have the same or similar control steps to:
  - Shut down, isolate, block, secure & dissipate stored energy
  - Place, remove & transfer LOTO devices & the responsibility for them
  - Test a machine/equipment to determine & verify the effectiveness of the control measures

Training & Retraining

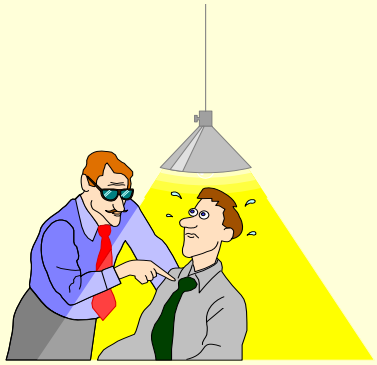
- Training elements:

  - Purpose & function of program
  - Procedure elements relevant to employees' responsibilities

    - **Authorized employees**
    - **Affected employees**
    - **Other employees**

  - Pertinent LOTO Standard requirements
- Additional training is required for tagout programs
- Retraining on job changes, procedure deviations/ inaccuracies

Communication



- ***Affected employee* notifications** regarding the application & removal of LOTO devices
  - See 1910.147(c)(9) & (e)(2)
- **Pre-shut-down knowledge** of the type & magnitude of energy, the energy hazards & the means to control the energy
  - See 1910.147(d)(1)

Periodic Inspections

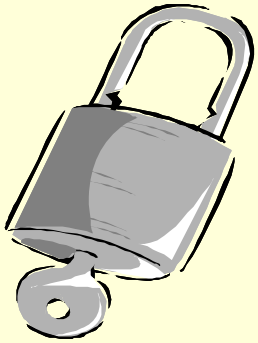
- Periodic inspection components:
  - Inspection of each procedure (annually)
  - Review employee responsibilities
- Inspector observes demonstration of procedure & talks to employees
  - *Authorized employees* for LO
  - *Authorized & affected employees* for TO
- Purpose is to verify:
  - Procedure steps are followed
  - Employees know their responsibilities
  - Procedure is adequate
- Intent is to correct deviations & inadequacies

Representative Inspections

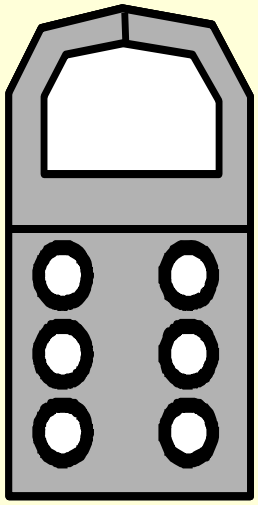
- Inspect a representative number of employees & perform supplemental review with remainder of employees
  - Streamlines inspection & review process
  - Used for same or similar machines/equipment that have same or similar control measures
  - Group meetings

- This approach is acceptable if the inspection sampling reasonably reflects:
  - Servicing and maintenance operations and
  - Hazardous energy control practices

Personal Lockout Tagout Devices

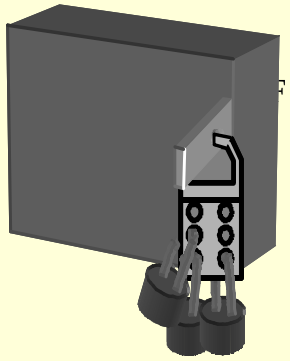


Group Lockout Tagout Mechanism



LOTO Hasp

Equipment Lockout Tagout



Electric Disconnect Switch

GROUP LOCKOUT/TAGOUT

Additional LOTO Requirements

- **Tagout Programs**
- Equipment component **testing** & **positioning** procedures
- **Shift & personnel change** procedures
- **Outside personnel** - contractors